

γ -Jet Acceptance and Efficiency

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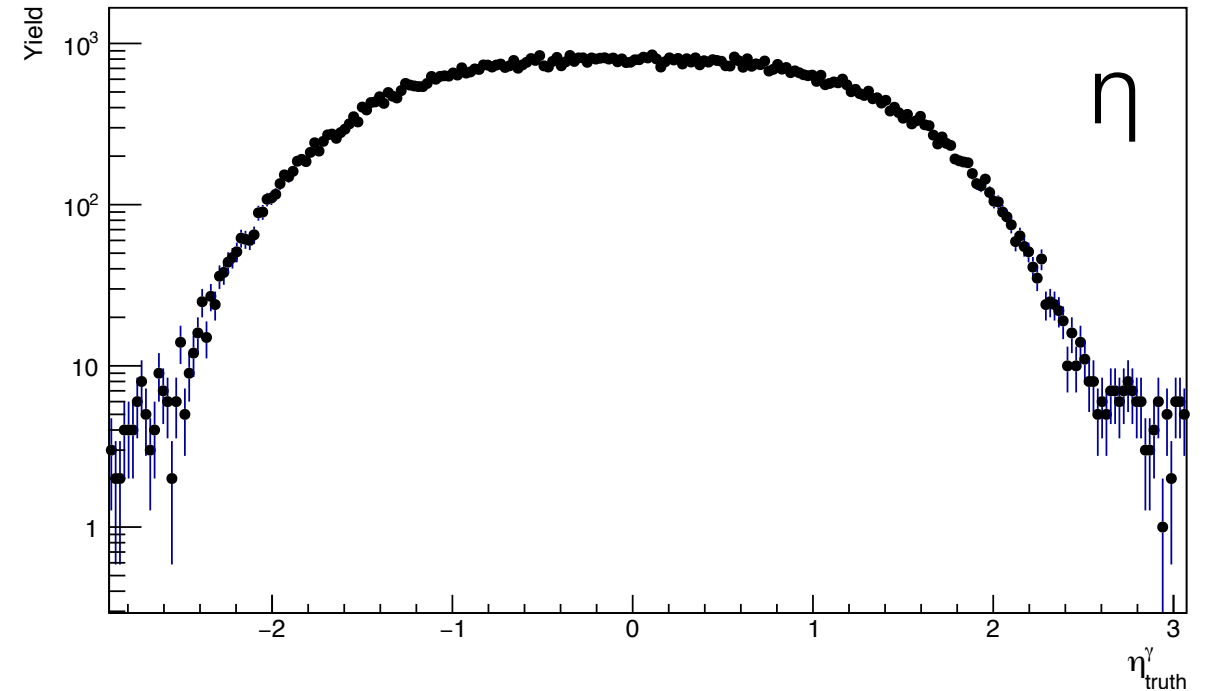
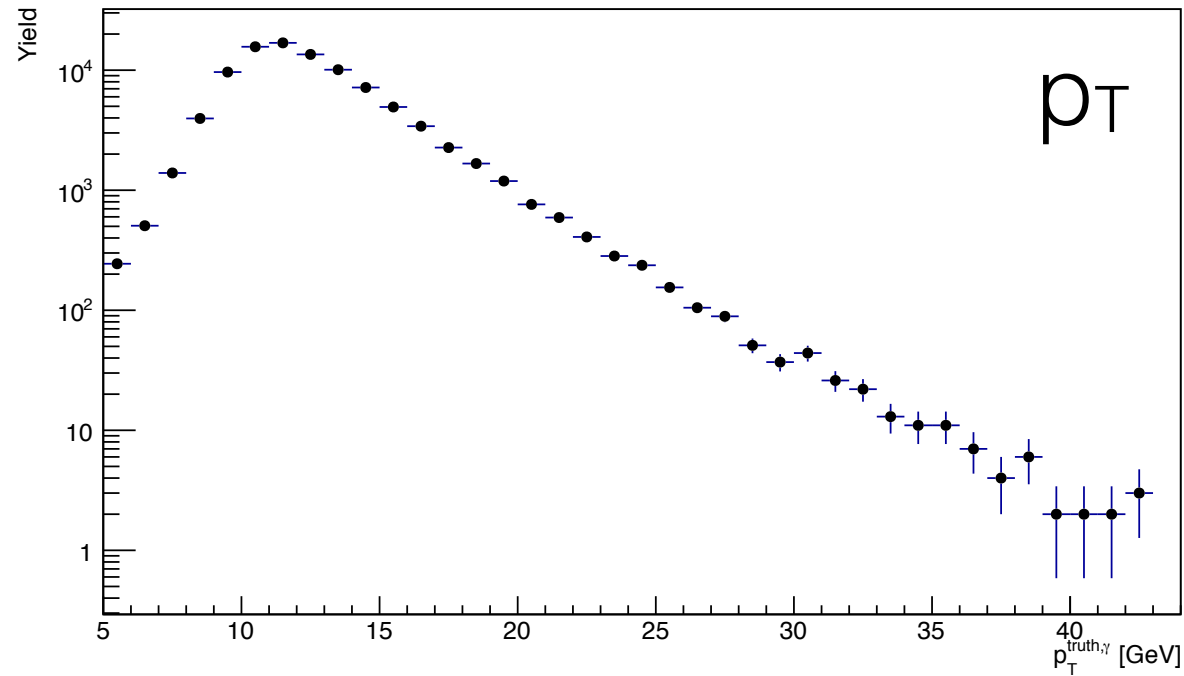
Last Time

- Last presentation: January 17, 2017
- Showed first study of γ -jet observables, detector response
- Based on cross section from PYTHIA, expect $\sim 800\text{k}$ QCD Compton scattering events
- Today:
 - Studies of acceptance and efficiency; how many will we really measure?
 - How small can we reliably resolve jets in p_T ?

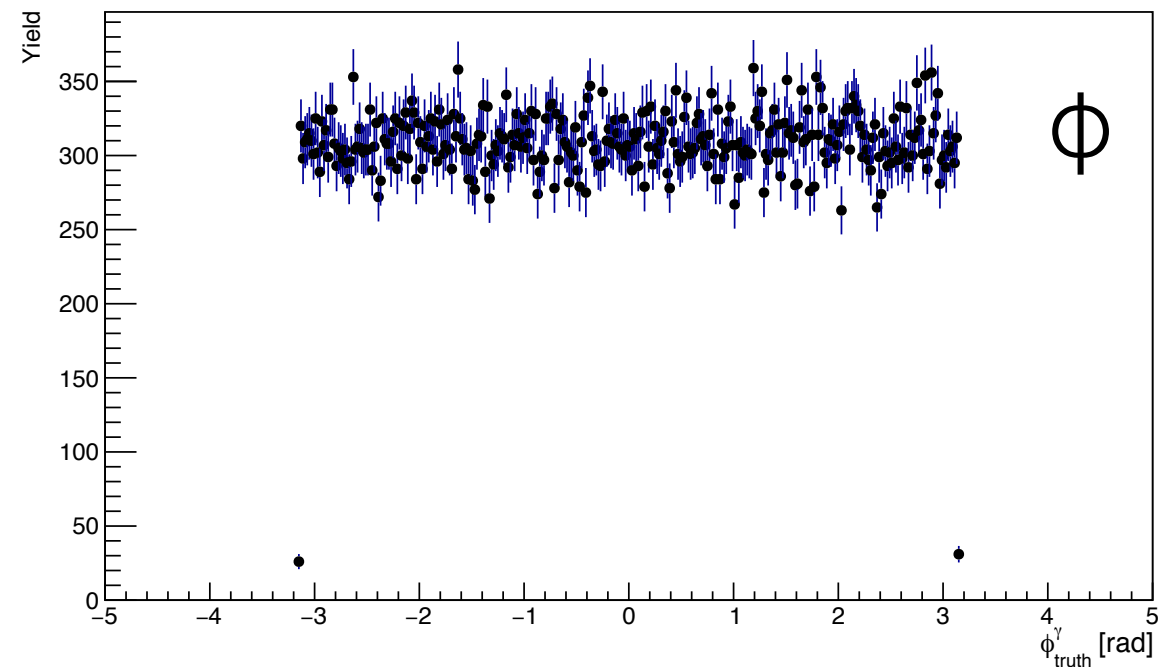
PYTHIA Requirements

- Using PYTHIA8 simulation, with all Prompt Photon processes on
- Require p_T (PhaseSpace:pTHatMin = 10.0) of hard scatter to be greater than 10 GeV
- No other phase space cuts
- Efficiencies are defined as $N_{\text{reco}}/N_{\text{truth}}$
- Require reconstruction $p_T^\gamma > 10$ and collect $R=0.4$ jets

Truth Distributions

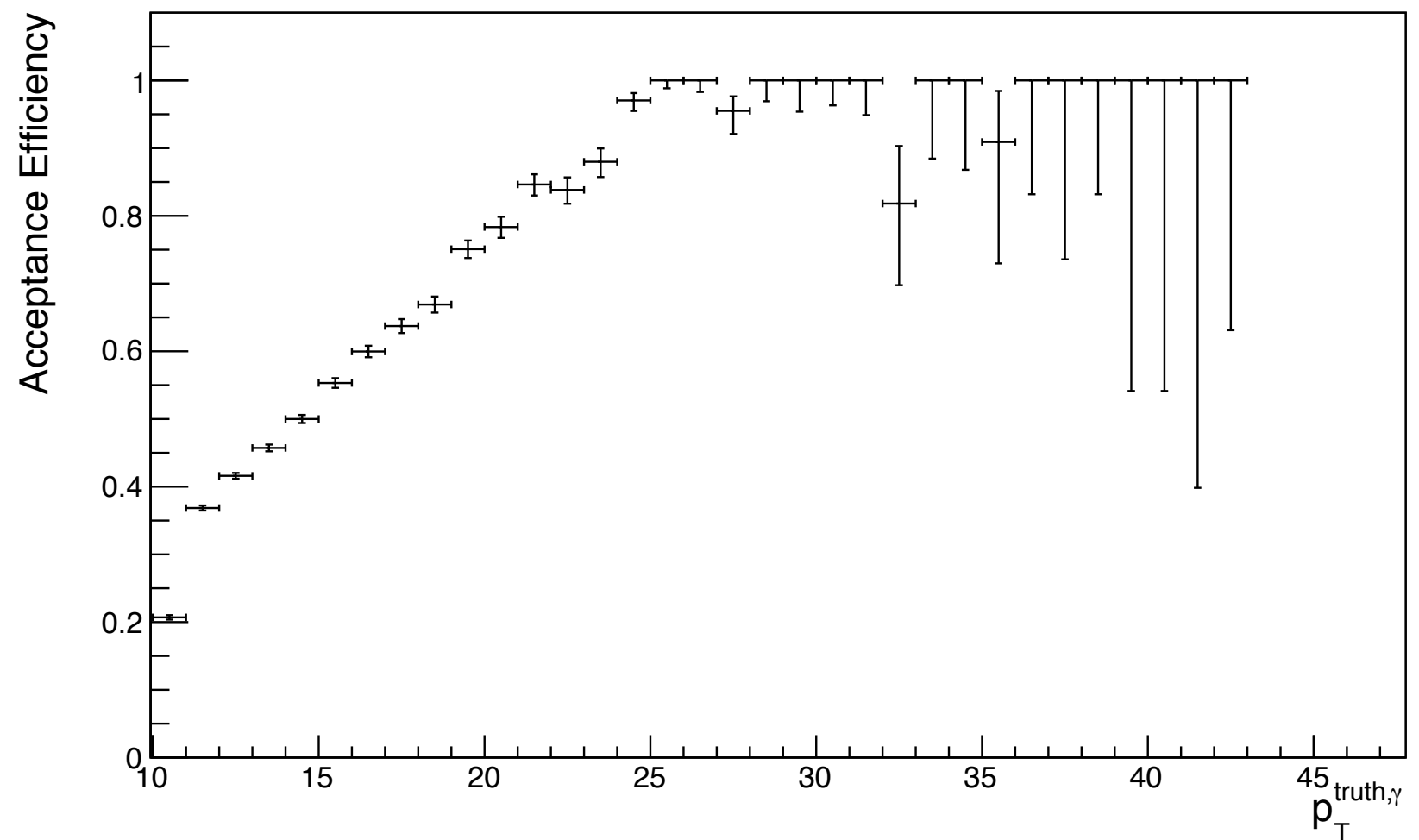


- Truth distributions look as expected



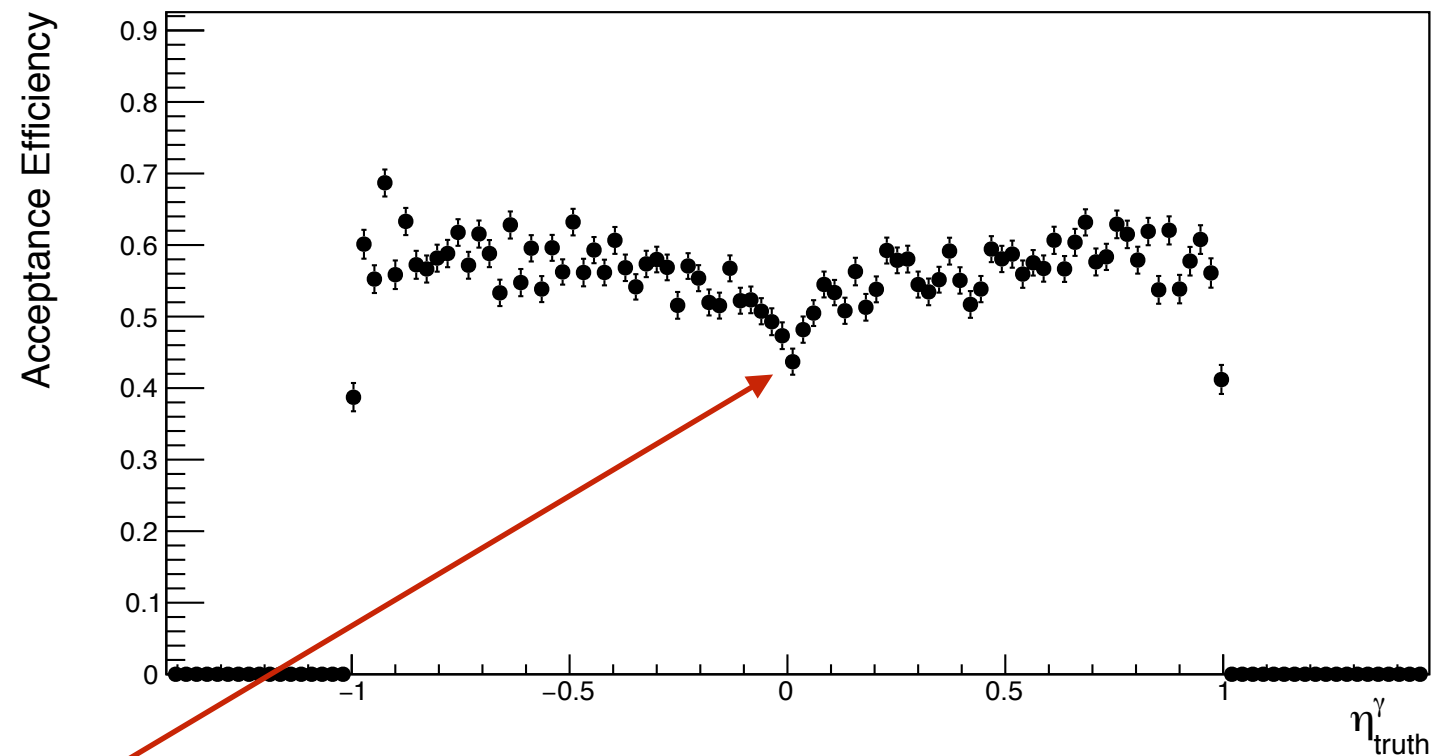
Reconstruction Efficiencies

- p_T efficiency starts small and approaches 1, albeit within large uncertainties at higher p_T
- Seems unreasonably large?

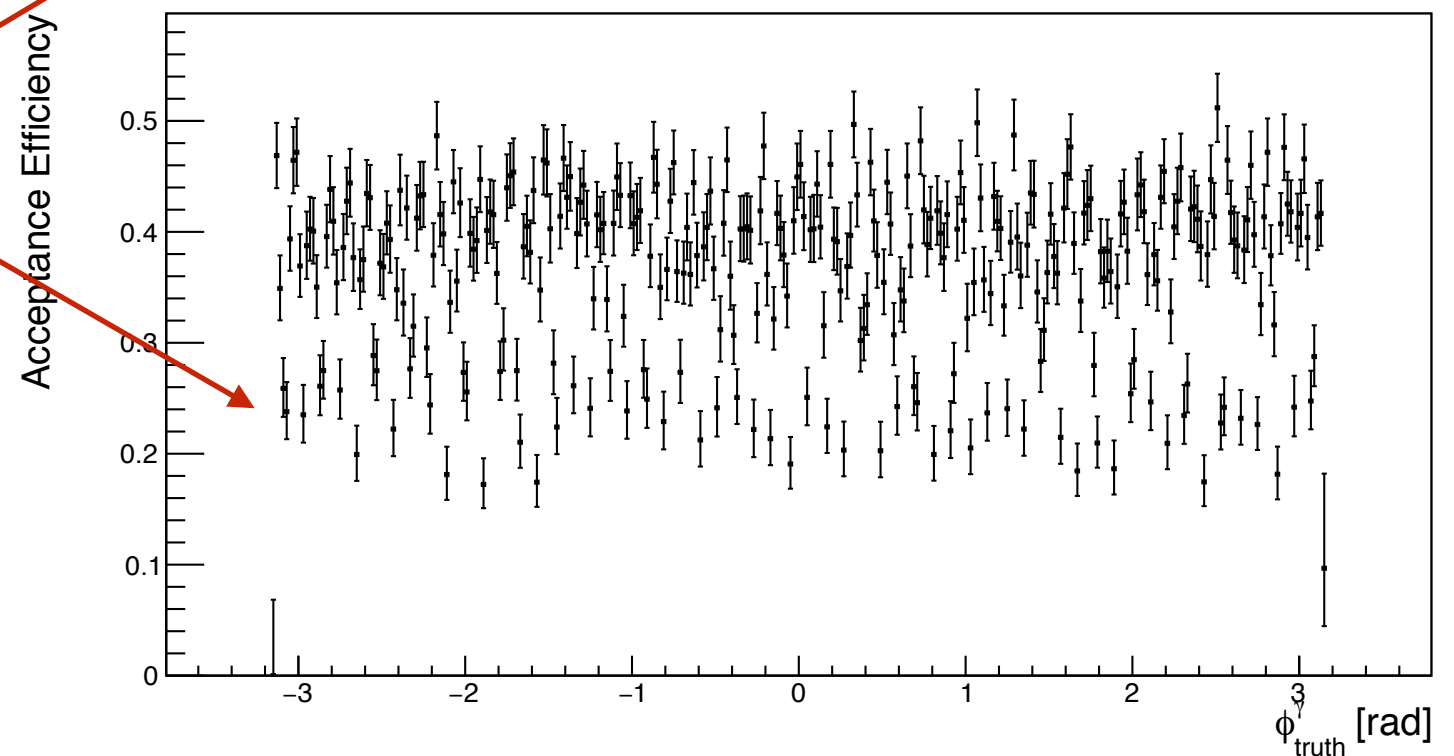


Reconstruction Efficiencies

- Efficiencies as a function of ϕ and η seem to make more sense, although still large

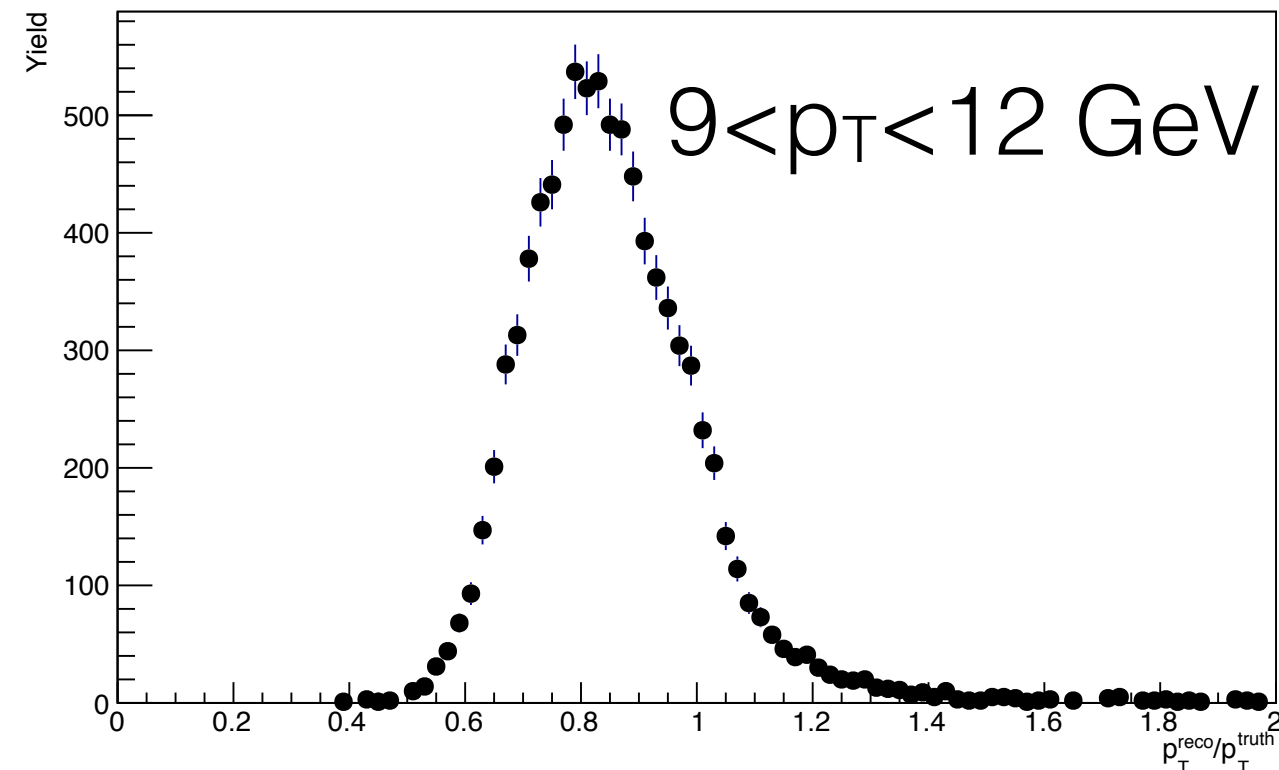
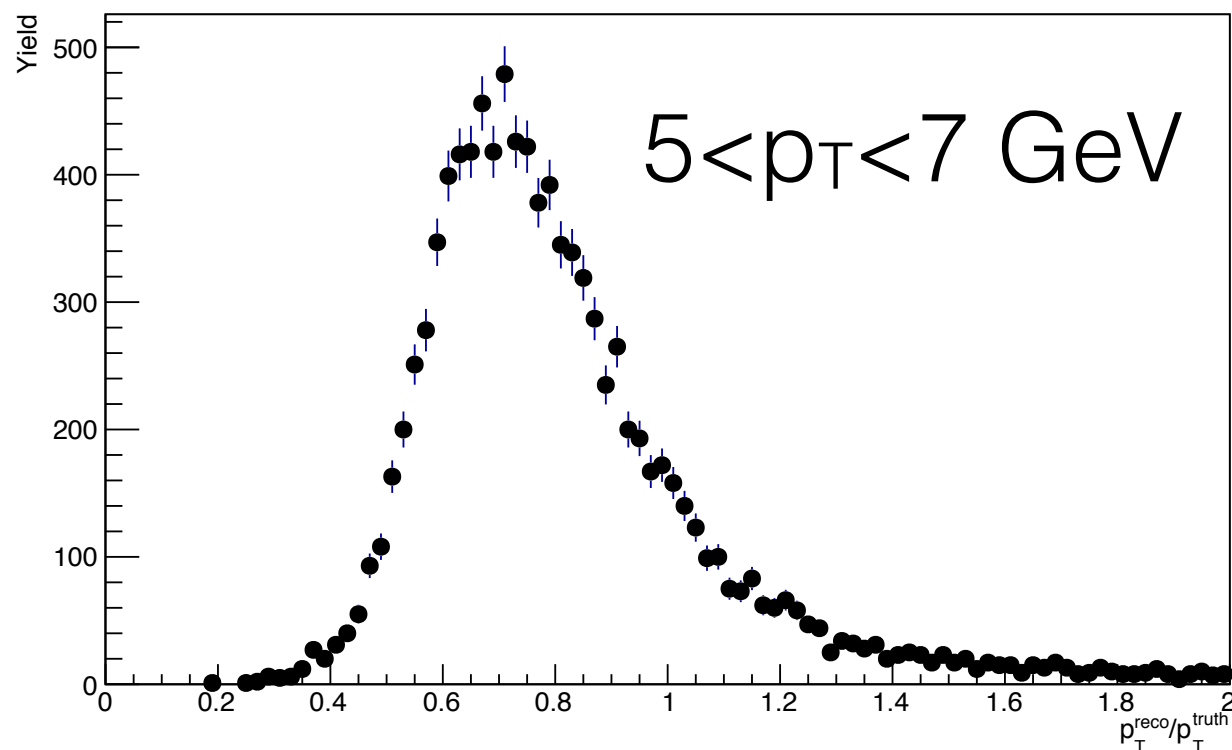
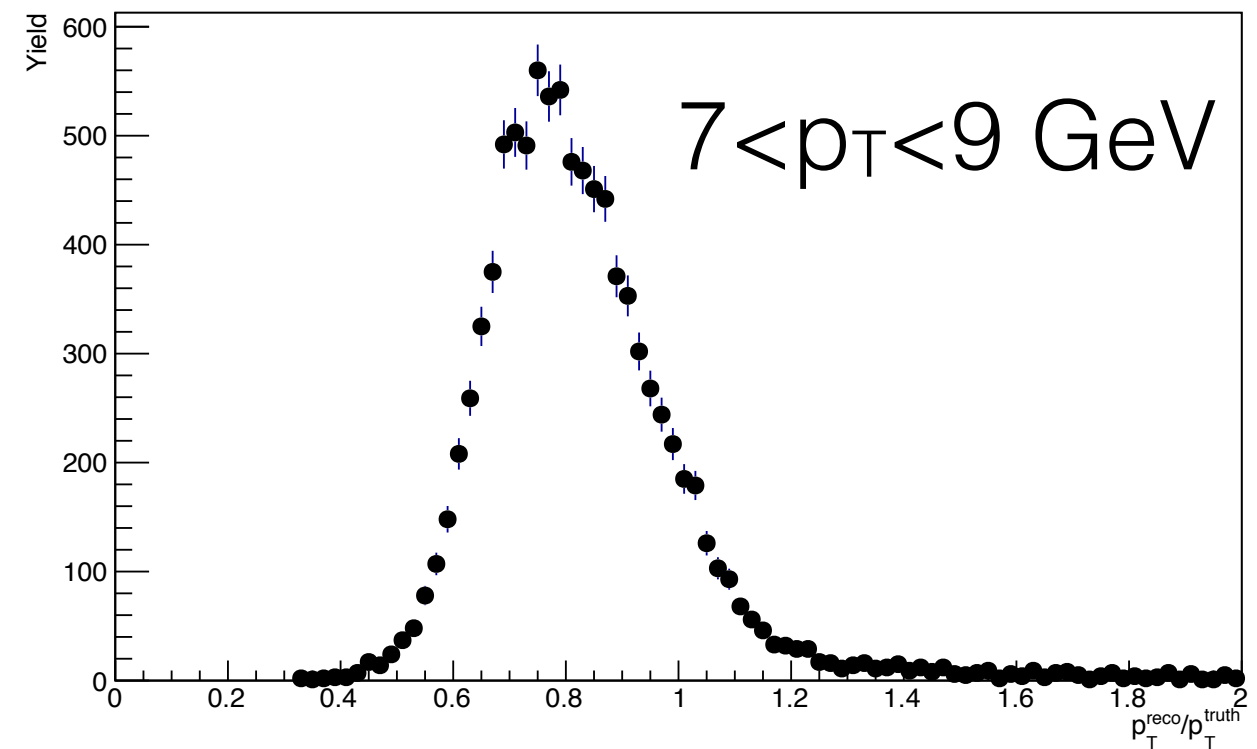


- Are these effects from the detector?
Clustering algorithm?



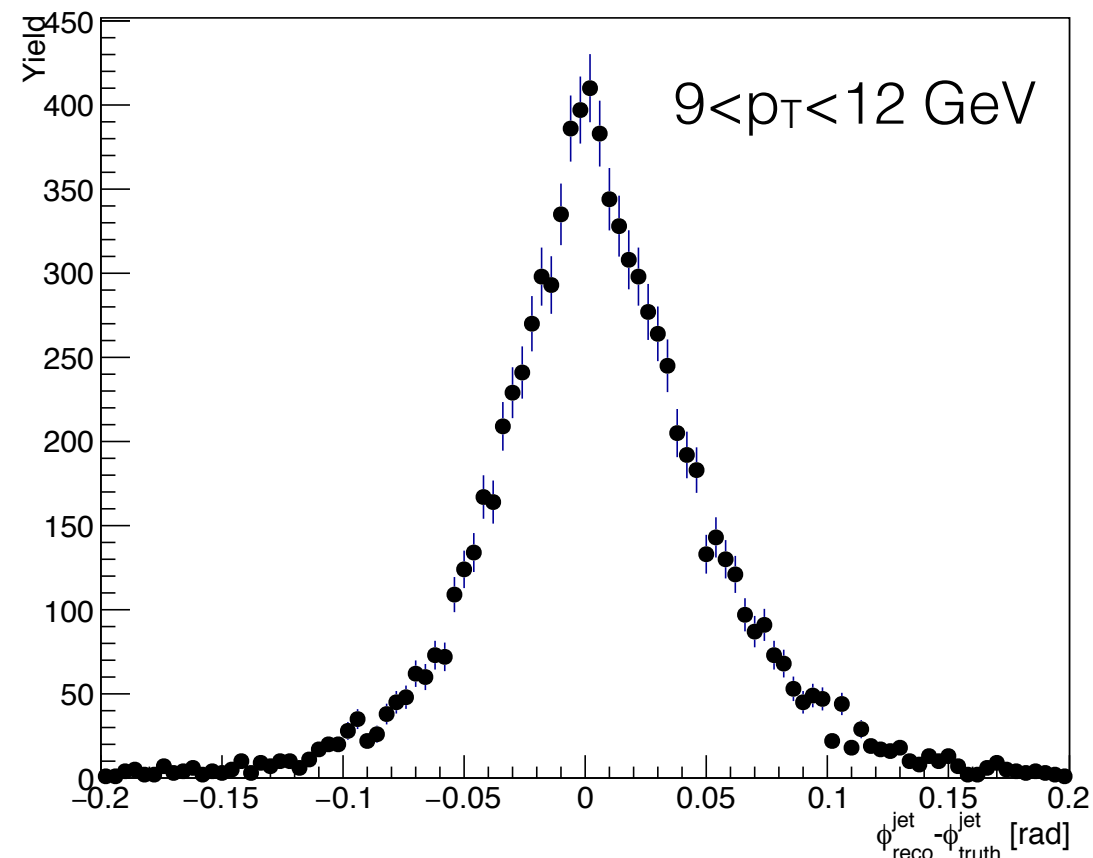
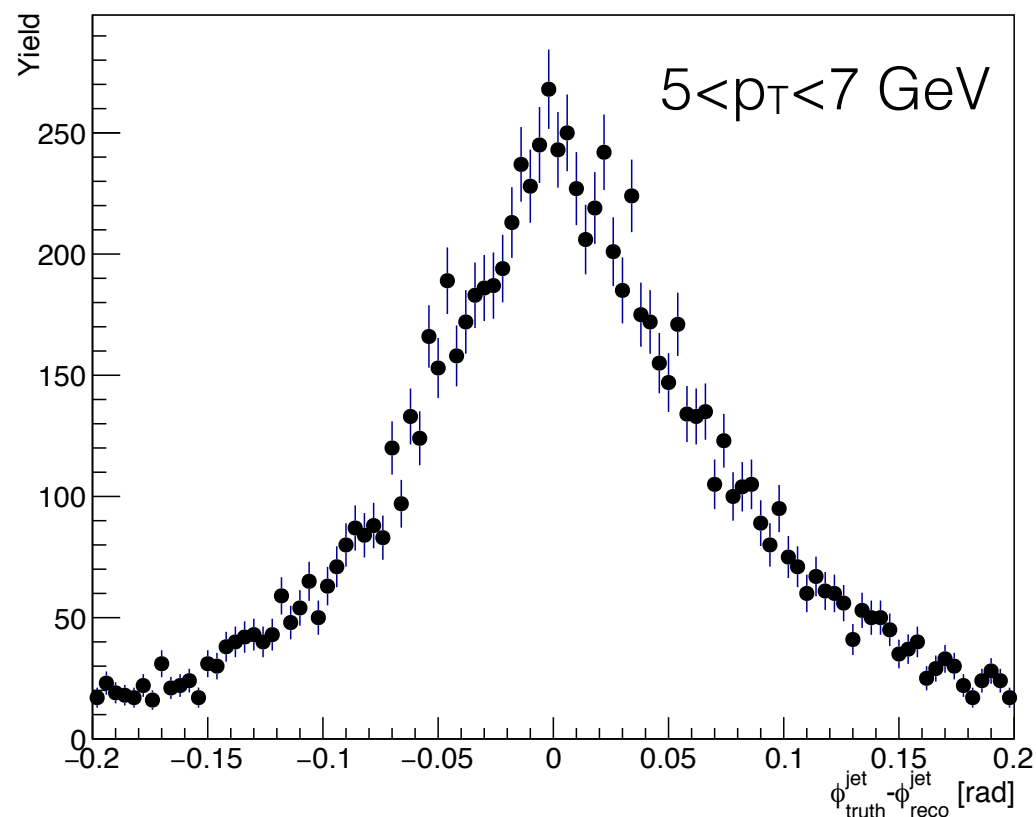
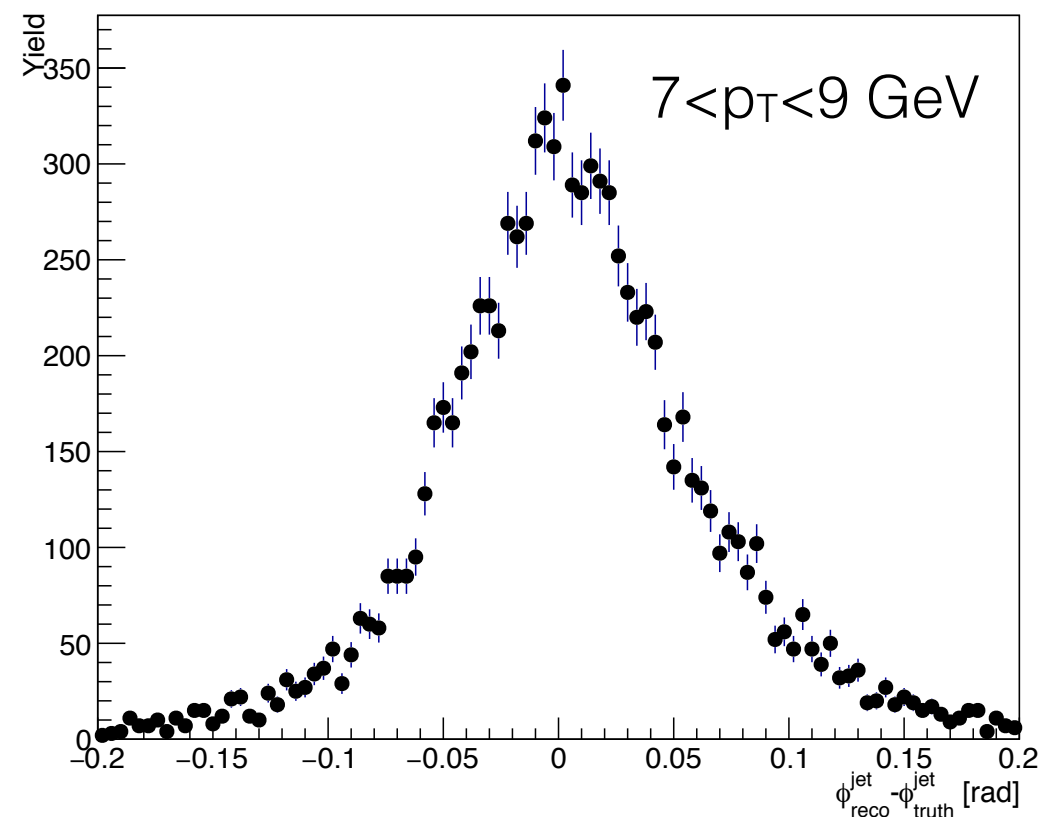
Jet p_T Response

- Reminder - this is only $R=0.4$ jets
- Would ideally like to measure to as small jet p_T as possible while still maintaining good p_T , ϕ resolution
- Seems ~ 8 GeV is the limit to returning to the nominal(ish) jet p_T response



Jet ϕ Response

- ϕ response follows similar behavior as p_T response
- Smaller p_T jets have $\sim 2\times$ worse resolution than previous study with >20 GeV jets
- Would like to study this as a function of cone size R

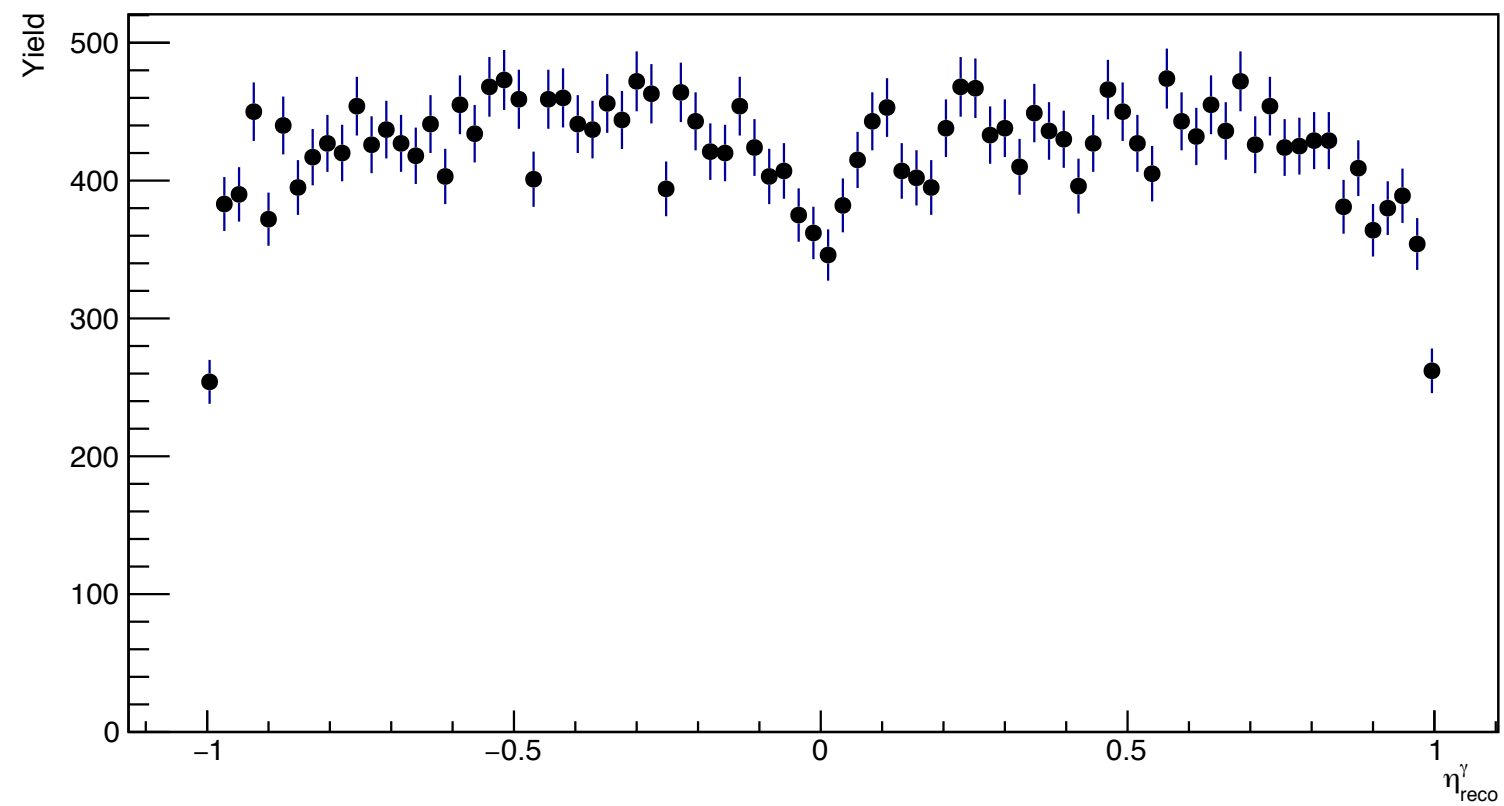
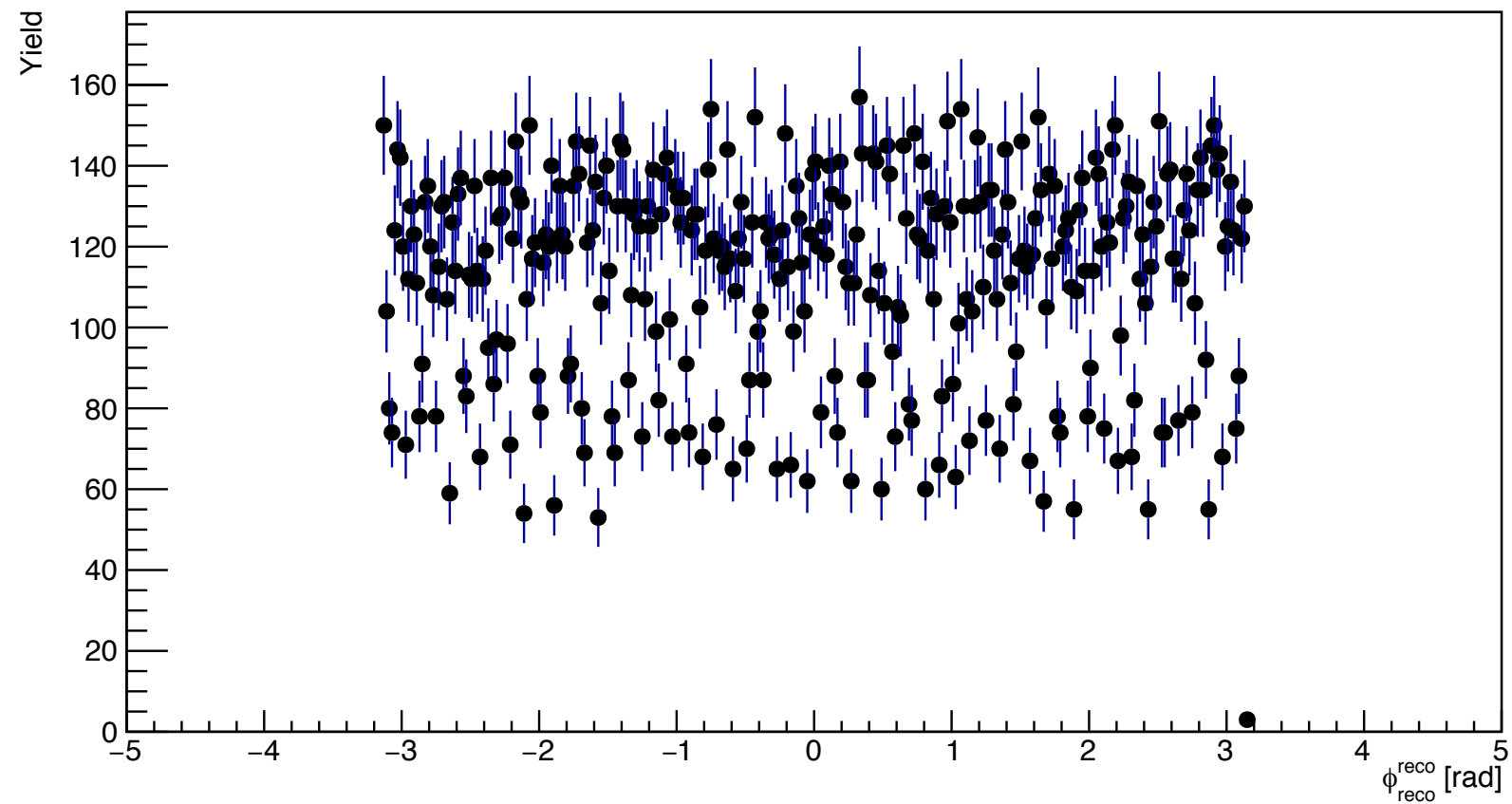


Conclusions

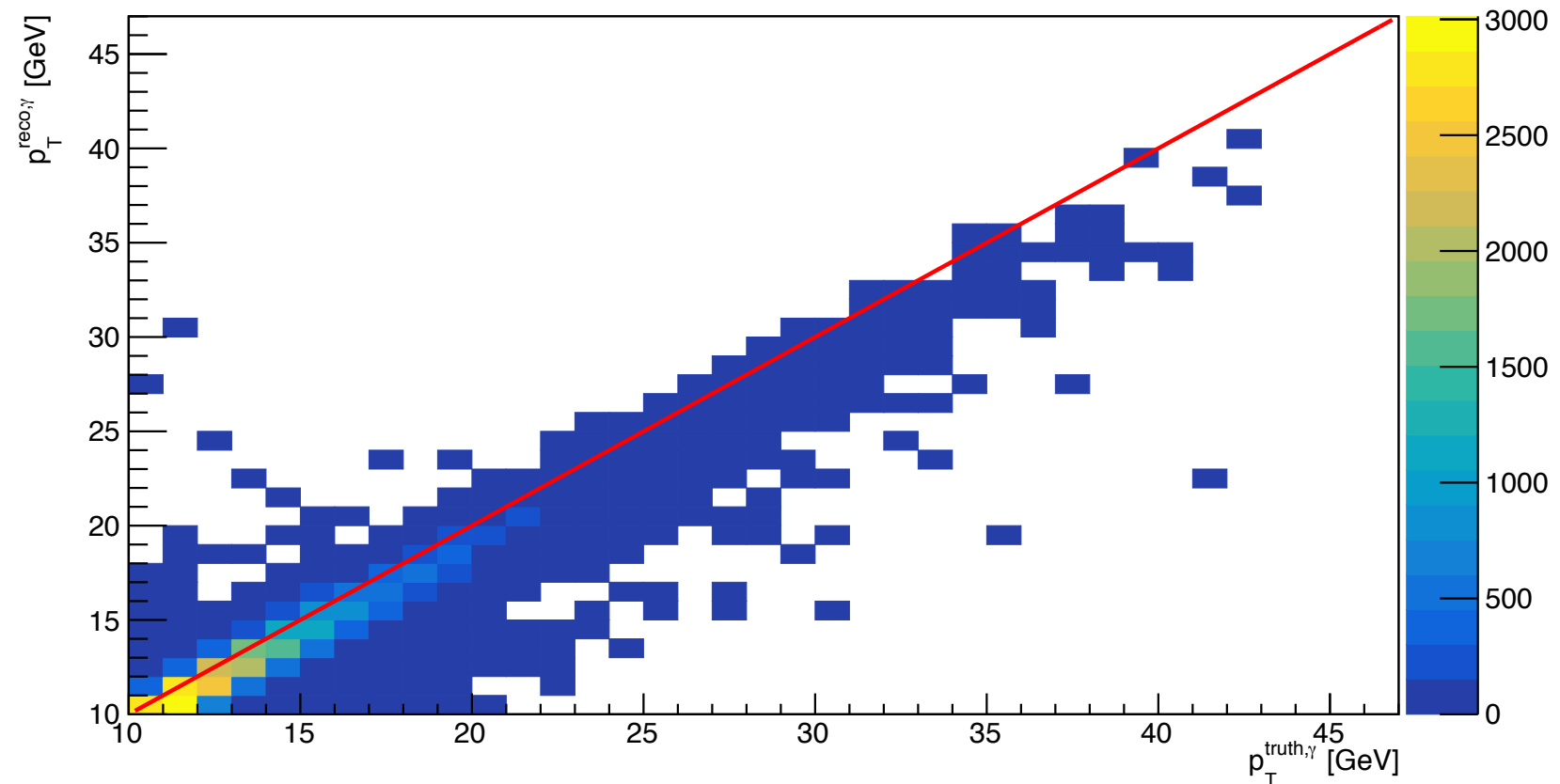
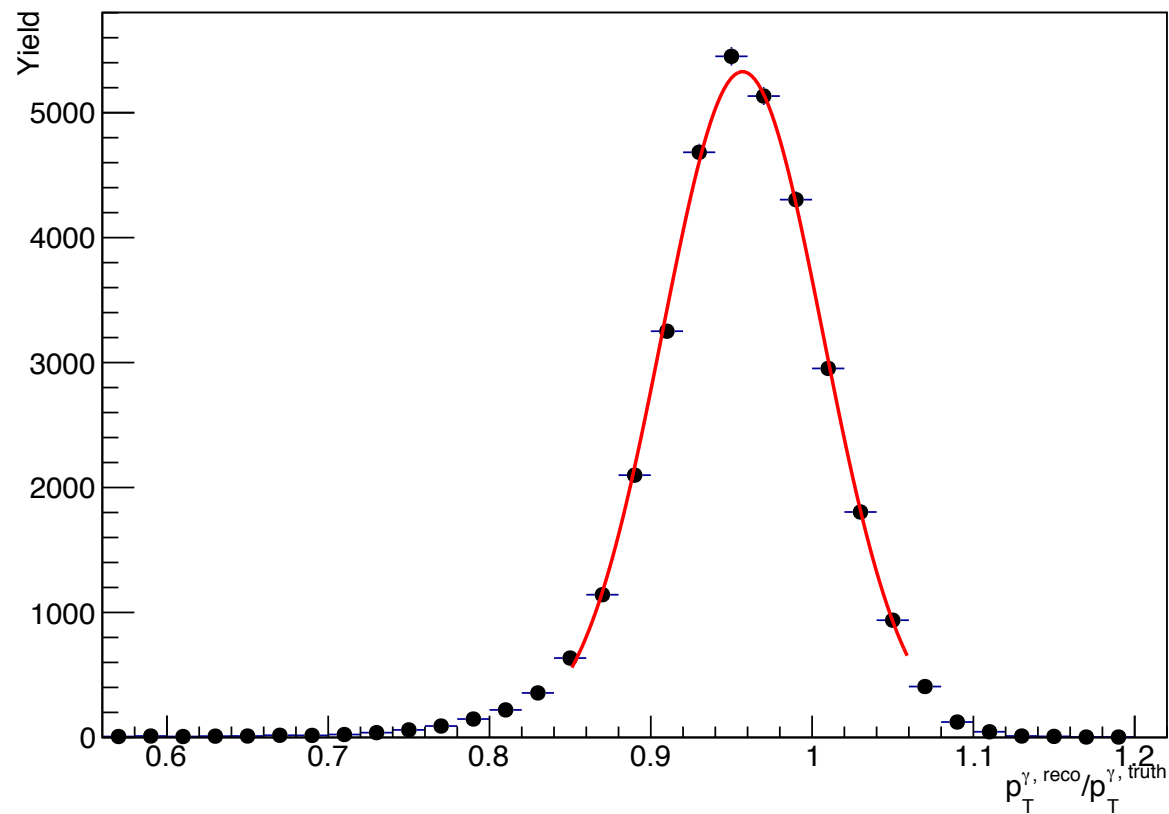
- Acceptance and efficiency seems unreasonably large at high p_T
- Acceptance and efficiency seem more reasonable as a function of η, ϕ , but still rather large. Perhaps it is due to the kinematic phase space I'm looking in?
- Jet p_T and ϕ response degrade considerably with jet p_T . Looks like the lowest reasonable hard scale we can look at is ~ 10 - 12 GeV or so.
- To-Do
 - Understand acceptance and efficiency
 - Run for different jet cone sizes R
 - Continue studying jet ϕ resolution offset as a function of jet characteristics

Back Up

Reconstructed ϕ , η Distributions



Photon p_T Response



Jet Response with high(er) p_T Jets

